Ecological Restoration Institute

Fact Sheet: An Example of Forest Restoration in a Warm/Dry Mixed-Conifer Forest May 2013

NORTHERN ARIZONA UNIVERSITY
Ecological Restoration Institute

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INTRODUCTION

The structure and composition of warm, dry mixed-conifer forests (Romme et al. 2009) have undergone considerable changes due to historical land uses and the disruption of frequent fire patterns that prevailed prior to Euro-American settlement of the western U.S. Warm, dry mixed-conifer forests of the Southwest that were historically more open and dominated by ponderosa pine have increased in tree density and shifted compositionally toward more mesic, shade tolerant tree species such as white fir and Douglas-fir (see Fulé et al. 2009). Structural and compositional changes have led to greater susceptibility to stand-replacing crown fires. Effects of a changing climate, particularly increased temperatures and an extended fire season in the next several decades may produce more frequent and intense fires and further complicate fire management.

In an effort to restore forest structure and function, land managers have focused on tree thinning and prescribed fire to create stands that are more productive and potentially more resilient to drought and stand-replacing crown fire. In this study, we set out to test alternative approaches that included evidence-based thinning, based on site-specific historical stand structure, and prescribed fire versus prescribed fire-only treatments. In 2003, we established a randomized, replicated experiment in a warm, dry mixed-conifer forest on the San Juan National Forest in southwest Colorado. The objectives of our study were to 1) compare the effects of treatments (Thin and Burn, Burn only, and untreated Control) on forest composition and structure; and 2) compare post-treatment stand structure with site-specific reconstructed reference conditions, as reported in Fulé et al. (2009).

Untreated Control: fire excluded for more than a century

Thin and Burn Treatment: one year after treatment

Burn Only Treatment: one year after treatment

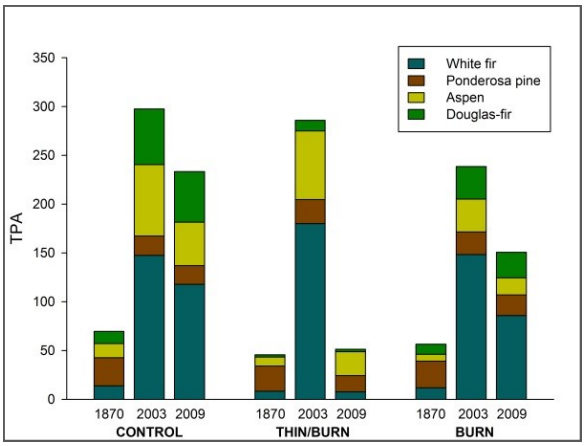

Figure 1. Trees per acre (TPA) by species for 1870 (reconstructed reference condition), pre-treatment (2003), and post-treatment (2009).

Research Findings

- Tree density and basal area were reduced 82% and 49% in Thin and Burn treatments compared to 37% and 16%, respectively, in Burn treatments. Younger and small white fir, Douglas-fir, and aspen were reduced the most (Figure 1).
- Thin and Burn treatment shifted forest structure and composition closer toward historic reference conditions compared to Burn only treatment.
- Surface fuels were reduced following both Thin and Burn and Burn only treatments as compared with the untreated Control group.
- Aspen regeneration (seedlings and suckers < 3.5 feet in height) increased following Thin and Burn treatment, whereas white fir and Douglas-fir regeneration decreased.

Management Implications

- More open stands dominated by fire-resistant tree species, such as ponderosa pine and Douglas-fir, not only represent historical conditions but are also more likely to be resilient to future disturbance and effects of climate change.
- Managers seeking to restore forest structure and function, and increase productivity and resilience, should consider evidence-based thinning and prescribed fire prescriptions.

References

Fulé, P.Z., J.E. Korb, and R. Wu. 2009. Changes in forest structure of a mixed conifer forest, southwestern Colorado, USA. *Forest Ecology and Management* 258:1200-1210. http://library.eri.nau.edu/gsdl/collect/erilibra/index/assoc/HASH0125/c4755931.dir/doc.pdf

Romme, W.H., M.L. Floyd, and D. Hanna. 2009. Historical range of variability and current landscape condition analysis: South central highlands section Southwestern Colorado and Northwestern New Mexico. Colorado Forest Restoration Institute, Ft. Collins, Co, USA.

This Fact Sheet summarizes information from the following publication:

Korb, J.E., P.Z. Fule, and M.T. Stoddard. 2012. Forest restoration in a surface fire-dependent ecosystem: An example from a mixed conifer forest, southwestern Colorado, USA. *Forest Ecology and Management* 269: 10-18. http://library.eri.nau.edu/gsdl/collect/erilibra/index/assoc/HASH0144.dir/doc.pdf

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